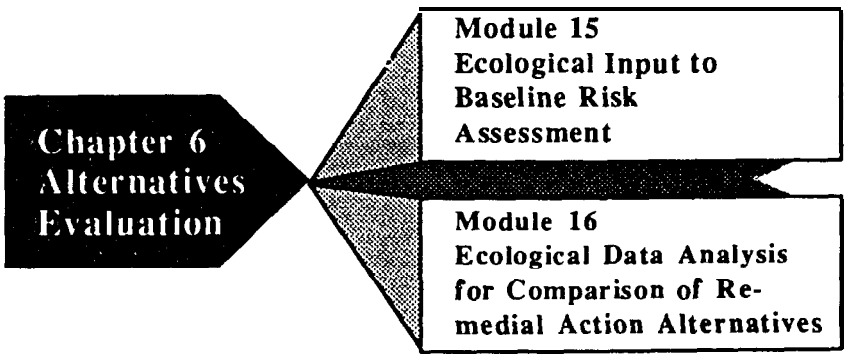
CHAPTER 6

Alternatives Evaluation



CONTENTS

CHAPTER 6: ALTERNATIVES EVALUATION

The RI/FS work plan will include specific tasks related to collection and analysis of ecological data. The NCP [40 CFR 300.430(d)] requires that ecological data be collected during the site characterization process and used in conducting a baseline risk assessment. This assessment is the no-action alternative. In some cases, however, the baseline risk assessment must be revised to reflect current interim cleanup actions. An example of a site with changing baseline conditions is the DOE Weldon Spring, Missouri, site where remediation will occur in phases, requiring a revision to the baseline assessment relative to health effects and groundwater (DOE 1992).

The ecological work plan should contain a section that addresses ecological information required to evaluate the no-action alternative either as a single assessment or a series of assessments as the baseline changes. Results of the ecological risk assessment can also be used to conduct a detailed evaluation of remediation alternatives during the FS. Nine criteria used in the FS for alternatives comparison are described in the NCP [40 CFR 300.430 (e)(9)iii] and subsequent EPA guidance (see Chapter 6 of EPA 1988a). Five of these criteria are included in Module 16 as the most relevant to ecological resources.

Nine Evaluation Criteria for Analysis of Remedial Alternatives

Threshold criteria
- -Overall protection of human health and the environment
- -Compliance with ARARs

Balancing Criteria
- -Long-term effectiveness and permanence
- -Reduction of toxicity, mobility, or volume through treatment
- -Short-term effectiveness
- -Implementability
- -cost

Modifying Criteria
- State acceptance
- -Community acceptance

The first criterion — overall protection of human health and the environment — and the criterion of compliance with ARARs are referred to as "threshold criteria" and must be met by the selected remedial alternative. Balancing criteria are considered carefully during the analysis of alternatives.

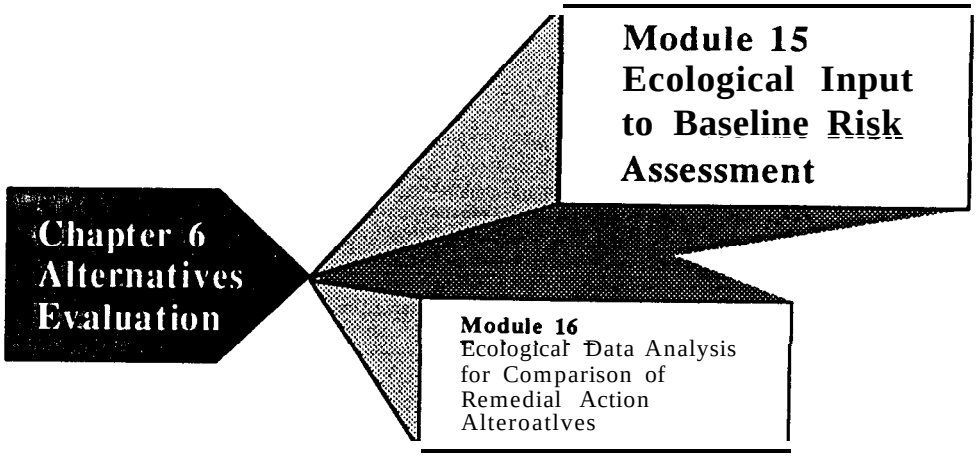
References

EPA, 1988a. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final,* report EPA/540/G-89/004, OSWER Directive 9335.3-01, U.S. Environmental Protection Agency, Washington, D.C.

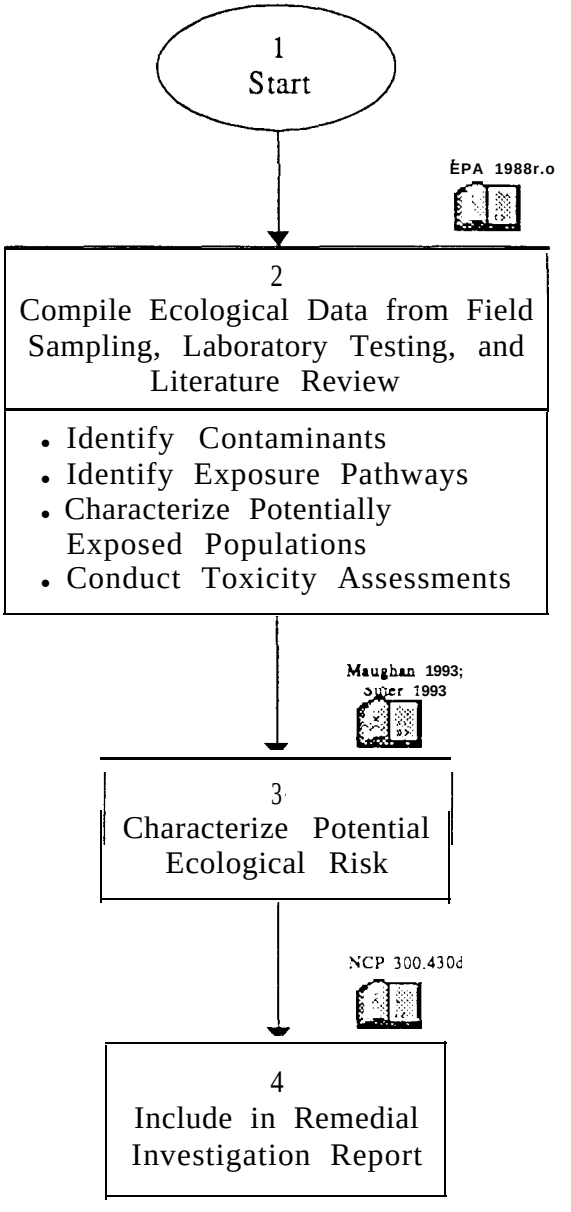
DOE, *1992. Baseline Assessment for the Chemical Plant Area of the Weldon Spring Site,* RI/FS EIS Document: DOE/EIS-0185D; Baseline Assessment: report DOE/OR/21548-091, U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, Tenn.

MODULE 15:

ECOLOGICAL INPUT TO BASELINE RISK ASSESSMENT



Module 15: Ecological Input to Baseline Risk Assessment



MODULE 16: ECOLOGICAL INPUT TO BASELINE RISK ASSESSMENT

Step 1 Start.

Step 2 Guidance for contractors charged with conducting baseline risk assessments should be examined before detailed planning starts for ecological aspects of the process (EPA 1988a,b). The overall ecological work plan (including the ecological field sampling plan and QAPP), when implemented, should provide all ecological data needed to conduct the baseline risk assessment. The baseline risk assessment identifies the risks associated with taking no further action (i.e., the no-action alternative in the FS report to the EPA). The baseline risk assessment should include contaminant characteristics and concentrations, exposure pathways, assessment results, receptor species and populations, and toxicity assessment results. Except for contaminant descriptions, all information should be obtained from existing ecological data or data gathered as described in the ecological field sampling plan (see Module 13) **(see Appendix A, Section *A.4.3*).**

Step 3 The conclusions regarding potential ecological risk should include supporting evidence in the form of statistically valid results of field and laboratory tests obtained through implementing procedures delineated in the overall ecological work plan, Uncertainties, variance estimates, and assumptions should be included in the analyses of baseline risk assessment data. Both Maughan (1993) and Suter (1993) cover the information needs and methods to characterize and report the ecological risk of the baseline condition at a CERCLA site.

Ecological input to the baseline assessment should include a summary of the following risk-related data: (1) environmental contaminant concentrations, (2) contaminant concentrations in biota, (3) toxicity test results, (4) literature values of toxicity, (5) field surveys of receptor populations, and (6) measures of community structure and ecosystem function (EPA 1989c).

Step 4 The RI report should define the ecological impacts that currently exist and that would be expected in the future if no remedial actions take place (NCP 300.430d). The goal of ecological input to the baseline risk assessment is to use toxicological and ecological information to estimate the likelihood that an undesired ecological event would occur if no remediation were undertaken.

References

EPA, 1988a. ***Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final,*** report EPA/540/G-89/004, OSWER Directive 9335.3-01, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1988b. ***Review of Ecological Risk Assessment Methods,*** report EPA/230/10-88/041.,, U.S. Environmental Protection Agency, Washington, D.C.

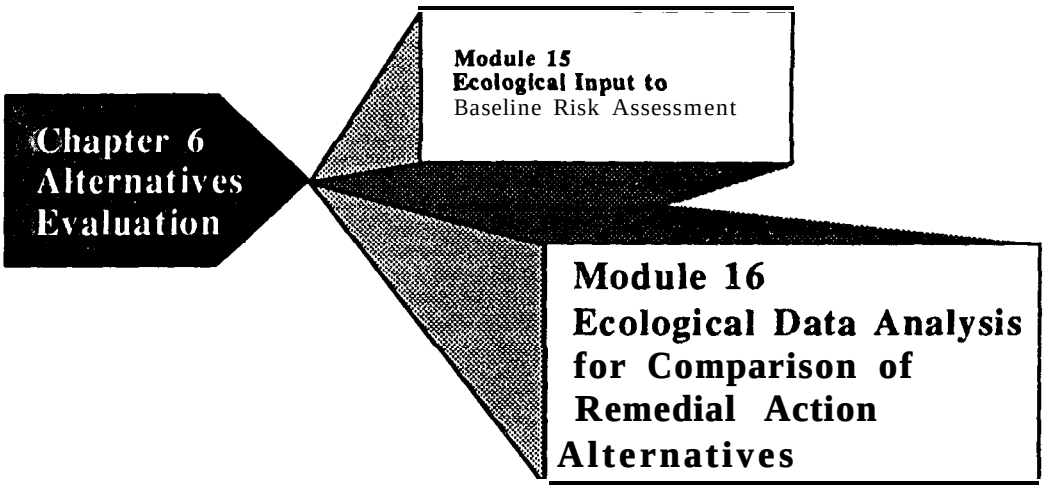
EPA, 1989c. ***Risk Assessment Guidance for Super-fund — Vol. II, Environmental Evaluation Manual,*** report EPA/.540/89/001, U.S. Environmental Protection Agency, Washington, D.C.

Maughan, J.T., 1993. ***Ecological Assessment of Hazardous Waste Sites.*** Van Nostrand. Reinhold, New York.

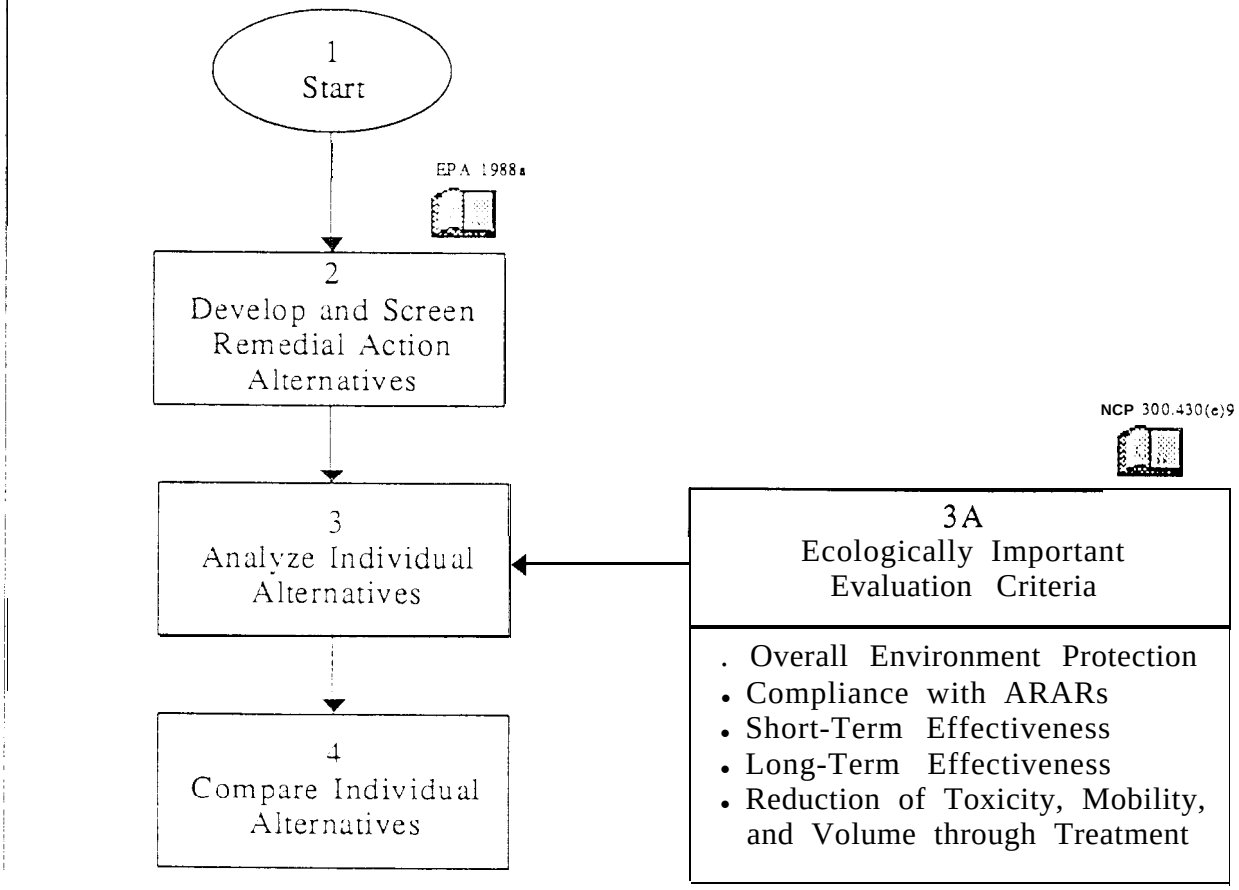
Suter, G.W., II, 1993. ***Ecological Risk Assessment.*** Lewis Publishers, Chelsea, Mich.

MODULE 16:

ECOLOGICAL DATA ANALYSIS FOR COMPARISON OF REMEDIAL ACTION ALTERNATIVES



Module 16: Ecological Data Analysis for Comparison of Remedial Action Alternatives



MODULE 16: ECOLOGICAL DATA ANALYSIS FOR COMPARISON OF REMEDIAL ACTION ALTERNATIVES

Step 1 Start.

Step 2 EPA guidance for conducting RIs and FSs should be reviewed by the technical staff developing remediation objectives (EPA 1988a). This module represents tasks carried out in the feasibility phase of the RI/FS process (Figure 1.1). These tasks include the identification and screening of alternatives that will remediate or control contaminated media (e.g., soil, surface water, groundwater, and sediments). Ecological input is used in screening alternatives. The regional BTAG should be consulted for detailed advice on applying ecological information to the FS process (EPA 1991a,b).

Step 3, 3a Individual alternatives identified during screening will all be subjected to the same level of detailed analyses. The nine evaluation criteria (listed in the text box of Chapter 6) should be reviewed before determining appropriate ecological input [see NCP, Part 300.430(e)9]. As identified in this step, five of the evaluation criteria are the most important relative to ecological resources. However, these criteria may not all apply to ecological resources at a particular site. *Important considerations in evaluating each alternative against the five criteria include differences in ecological impacts associated with good engineering practices, the type of mitigation proposed, and the short-term impacts of conducting the remediation.* In some cases, the ecological impacts associated with implementing the remediation could be greater than those for the no-action alternative. For example, if incineration of hazardous materials was an alternative, location of equipment and disposal of ash could impact existing habitats that are sensitive or limited in areal extent within the site vicinity. For alternatives involving excavation of the hazardous materials from wetland sites, the act of remediation could have permanent ecological impacts through loss of the wetland resource or disturbance to adjacent habitats. Also, construction of new roads for remedial action at a contaminated site may result in ecological risks of the same order of magnitude, or even have greater risk, than leaving the hazardous substances in its present location and implementing remediation measures not involving transport. Coordination in planning for new road construction is essential for minimizing ecological impacts of remediation. Project engineers and ecologists can minimize impacts to sensitive biotic communities or species through careful planning in road route selection,

Ecological Assessment in the FS Process

The ecological assessment is used in the detailed analysis of remedial alternatives by identifying risks or benefits of each alternative to ecological receptors (EPA 1991a,b).

design, and construction mitigation. These issues should be considered in evaluating ecological risk of each remediation alternative.

Step 4 Summarized findings relative to the evaluation criteria will be included in tabular form for each remediation alternative. This information will be contained in the FS. The comparison of remediation alternatives may require establishing cleanup levels that afford adequate protection to the most sensitive species. For example, a very conservative approach was taken at a polychlorinated-biphenyl- (PCB-) contaminated palustrine wetland site in Massachusetts, where data from published laboratory studies were used to establish dietary levels believed to be safe for small mammals, birds, raccoon, and mink. Based on assumptions on diet composition, home range size, and bioaccumulation factors, conservative levels were set for soil/sediment cleanup of PCBs (Boucher et al. 1991). This approach was taken in the absence of site-specific data on diet and PCB contamination levels at the site.

References

Boucher, P.M., et al., 1991. *Ecological Exposure Assessment of a PCB-Contaminated Wetland in Massachusetts*, pp. 706-709, in: Proceedings of the 12th National Conference Hazardous Materials Control/Superfund Conference, Washington, D.C., Dec. 3-5, Hazardous Materials Control Research Institute, Greenbelt, Md.

EPA, 1988a. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final*, report EPA/540/G-89/004, OSWER Directive 9335.3-01, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1991a. *Risk Assessment Guidance for Superfund: Volume 1-Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals,* Office of Emergency and Remedial Response, Publication 9285.7.01B, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1991b. *ECO Update, Ecological Assessment of Superfund Sites: An Overview,* U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Intermittent Bulletin 1(2):1-8, Washington, D.C.